Space Weather Forecast

Issued on Thursday 2 January 2025 at 12:20 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Moderate flares expected, slight chance of Strong flares. Chance G1 Minor Storms Days 1 and 3 (02 and 04 Jan).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Moderate activity has been observed with three Moderate class flares. There are twelve regions on the Earth-facing disc, with the most active region no longer visible on the west limb, but a new region rotating onto the east limb. The new region on the east limb is still difficult to analyse due to the viewing angle. Some growth has been observed on the disc, with a region in the southeast showing rapid growth in its northern spot, although it appears to have a fairly simple magnetic structure at present. Also of interest is another region in the southeast, as while this is a relatively simple bipolar structure, it has developed some intermediate spots. A newly numbered region in the southwest developed rapidly in the last 24 hours, but has a straightforward magnetic structure. A further region in the southwest remains a somewhat complex sunspot, and is just about showing penumbra on the southern spot. This group has a more north-south aligned magnetic structure which could increase instability. Other groups appear fairly simple at the present time.

No Earth directed Coronal Mass Ejections (CMEs) have been observed in the last 24 hours.

Solar Wind / Geomagnetic Activity: Solar winds showed ongoing but waning CME influence. Wind speeds were mostly elevated, varying mainly between 470-500 km/s. Interplanetary Magnetic Field was strong until 01/1830 UTC, then eased to become mostly moderate. The north-south component was persistently strongly negative until 01/1620 UTC. It then became weakly northward directed, and is now moderately southward directed. Geomagnetic activity was initially at G2/Moderate Storm, with one G4 Severe Storm interval reported by BGS at 01/1500-1800 UTC. However other centres (Potsdam, SWPC) have reported G3 Strong Storm intervals for 01/1200-1500 and 011800-2100 UTC. Thereafter it became Quiet to Active. Aurora was observed across many parts of the UK.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) remained at background levels with no Solar Radiation Storms observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Moderate activity is expected to continue, with a slight chance of isolated Strong flares. This risk declining a little as the main active sunspot region rotates away from the west

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limb.

Solar Wind / Geomagnetic Activity: There is one potential Earth directed CME, which is expected to pass near Earth early on Day 3 (04 Jan), but with low confidence. Solar winds are currently elevated but easing after the CME arrivals on 31 Dec and 01 Jan. A coronal hole may then give elevated wind speeds on Days 3-4.

Geomagnetic activity is expected to be Unsettled to Active at first, with a chance of G1/Minor Storm intervals, slowly easing to become Quiet to Unsettled by Day 2 (03 Jan). Any CME arrival on Day 3 could occur alongside the coronal hole enhancement, which brings a potential for Active to G1/Minor Storms on Day 3. There is a slight chance of G2 Moderate storm intervals. Elevated wind speeds continuing into Day 4, but geomagnetic activity is likely to tail off.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is likely to persist at background levels with a slight chance of Solar Radiation Storms occurring, this risk declining a little as the main active region rotates well away from the west limb.

Geomagnetic Storms

Geomagnetic Storm	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Minor or Moderate	G1 to G2	Yes	25	5	30	10
Strong	G3	Yes	1	1	1	1
Severe	G4	Yes	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X-Ray Flares

X-Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 (M Class)	Yes	80	70	60	60
Very Active	R3-R5 (X Class)	No	15	10	10	10

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Solar Radiation Storms (High Energy Protons)

Radiation Storms Probability (Exceedance)	Level ($cm^{-2}sr^{-1}s^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	20	20	20	15
Very Active	**≥ S3 ***	No	5	5	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and/or 50 MeV ≥ 10pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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